instantaneous voltage signal of the electrical power signal and an instantaneous current signal of the electrical power signal;

carrying out a relative phase shift between the instantaneous voltage signal and the instantaneous current signal;

calculating a second instantaneous power component as the product of the relatively phase-shifted instantaneous voltage and instantaneous current signals;

RMS averaging each of the first and second power components to determine their respective magnitudes; and

using both of the calculated magnitudes to determine the value of the electrical power parameter.

63. A method according to Claim 62, wherein the step of carrying out a relative phase shift comprises phase shifting the instantaneous voltage of the electrical power signal prior to calculating the second instantaneous power component.

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64. A method according to Claim 62, wherein the step of carrying out a relative phase shift comprises carrying out a relative phase shift of 90 degrees.

65. A method according to Claim 62, further comprising determining the Apparent Power of the electrical power signal by calculating the square root of the sum of the squares of the RMS values of the first and second instantaneous power components.

66. A method according to Claim 62, further comprising measuring the mean value of the first instantaneous power component to determine the Active Power of the electrical power signal.

67. A method according to Claim 65, further comprising:

measuring the mean value of the first instantaneous power component to determine the Active Power of the electrical power signal; and

calculating the ratio of measured Active Power of the electrical power signal to the measured Apparent Power of the electrical power signal, the value of the ratio being the Power Factor of the electrical power signal.

68. A method according to Claim 66, further comprising integrating the Active Power value over time to determine the Energy Consumption of the electrical power signal.

69. A method according to Claim 62, further comprising measuring the mean value of the second instantaneous power component to determine the Reactive Power of the electrical system.

70. A method according to Claim 62, further comprising filtering at least one of the instantaneous voltage or instantaneous current signals of the electrical power signal, prior to their use in the calculating steps.

a cont.

71. A method according to Claim 70, wherein the filtering step results in the fundamental frequency component of at least one of the instantaneous voltage or instantaneous current signals being obtained.

72. A method according to Claim 70, wherein the filtering step results in at least one of the harmonic frequency components of at least one of the instantaneous voltage or instantaneous current signals being obtained.

73. A method according to Claim 70, wherein the filtering step comprises:

filtering the instantaneous voltage signal to obtain its fundamental frequency components; and

using the filtered instantaneous voltage signal and the unfiltered instantaneous current signal to measure a Network Delivered Power Parameter.

74. A method according to Claim 70, wherein the filtering step comprises:

filtering the instantaneous voltage signal to obtain its fundamental frequency components;

filtering the instantaneous current signal to obtain at least one of its harmonic frequency components; and

using the filtered signals to determine a Current Distortion Power Parameter.

75. A method according to Claim 70, wherein the filtering step comprises:

filtering the instantaneous voltage signal to obtain at least one of its harmonic frequency components;

filtering the instantaneous current signal to obtain its fundamental frequency components; and

using the filtered signals to determine a Voltage Distortion Power Parameter.

76. A method according to Claim 70, wherein the filtering step comprises:

filtering the instantaneous voltage signal to obtain at least one of its harmonic frequency components;

filtering the instantaneous current signal to obtain at least one of its harmonic frequency components; and

using the filtered signals to determine a Harmonic Apparent Power Parameter.

a cont.

77. A method according to Claim 73, further comprising comparing the Delivered Power Parameter, the Harmonic Apparent Power Parameter, the Voltage Distortion Power Parameter, or the Current Distortion Power Parameter with another power parameter determined by the method to produce a dimensionless figure of merit representative of the waveform distortion produced, in the electrical power signal, by a load to which the electrical power signal is supplied.

78. A method according to Claim 70, further comprising: providing two or more different types of filtering; and selecting between these different types of filtering to obtain two or more different electrical power parameters.

79. A method according to Claim 62, wherein:

the electrical power signal is a multiple-phase signal;

the calculating steps comprise: calculating a single first instantaneous power component for each of the multiple phases; summing the single first instantaneous components together; calculating a single second instantaneous power component for each of the multiple phases; and summing the single second instantaneous components together; and

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the RMS averaging step comprises: averaging the summed first instantaneous power components and the summed second instantaneous components; and combining them together to provide the first and second averaged instantaneous power components.

80. A method according to Claim 79, wherein the electrical power signal comprises an unbalanced multiple-phase signal.

81. A method according to Claim 79, wherein the electrical power signal comprises a

balanced multiple-phase signal.

82. A method according to Claim 79, further comprising resolving the multiple-phase signal into a phase sequence for use in establishing the effect of a load on an electric power network.

83. A method according to Claim 82, wherein the phase sequence comprises a positive-phase sequence in order to obtain a measure representative of the power generated at a source of the electrical power signal.

84. A method according to Claim 82, wherein the phase sequence comprises negative and zero-phase sequences in order to obtain a measure representative of the power converted in the load.

85. A method according to Claim 83, wherein the phase sequence comprises negative and zero-phase sequences in order to obtain a measure representative of the power converted in the load and the positive, the negative and the zero-phase sequences are used to obtain a measure representative of the power used by the load.

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86. A method according to Claim 82, wherein the resolving step is operatively selectable by a user.

87. A method according to Claim 62, further comprising converting the instantaneous current signal of the electrical power signal into a proportional voltage representation signal for use in the calculating and averaging steps.

88. A method according to Claim 62, further comprising converting the instantaneous

voltage and instantaneous current signals of the electrical power signal into frequency spectra, and wherein the calculating and averaging steps are implemented in the frequency domain with equivalent frequency spectra processing steps.

89. A method of measuring a power parameter such as Apparent Power or Power Factor, of an electrical power signal, the method comprising converting measured instantaneous voltage and current signals of the electrical power signal into the frequency domain and carrying out frequency spectrum analysis on the signals to derive the power parameter.

90. A method of Claim 89, further comprising: carrying out a relative phase-shift between the instantaneous voltage signal and the instantaneous current signal; and converting the relatively phase-shifted instantaneous voltage and current signals into the frequency domain for use in the frequency spectrum analysis.

91. A method of Claim 89, further comprising: carrying out a relative phase-shift between the instantaneous voltage signal and the instantaneous current signal in the frequency domain for use in the frequency spectrum analysis.

92. A method of Claim 90, wherein the frequency spectrum analysis involves carrying out a first convolution of the frequency spectra associated with the instantaneous voltage and current signals, a second convolution of the frequency spectra associated with the phase-shifted instantaneous voltage and current signals, and combining the results of the first and second convolutions.

93. A method of Claim 92, wherein the electrical power parameter comprises Apparent Power and the combining step comprises determining the square root of the sum of

the squares of the frequency components of the first and second power spectra.

94. A method of Claim 90, wherein the step of carrying out a relative phase shift comprises carrying out a relative phase shift of 90 degrees.

95. A method according to Claim 89, further comprising filtering at least one of the instantaneous voltage or instantaneous current signals of the electrical power signal, in the frequency domain or prior to the conversion of the at least one signal into the frequency domain.

96. A method according to Claim 95, wherein the filtering step results in the fundamental frequency component of the electrical power signal being obtained.

97. A method according to Claim 95, wherein the filtering step results in at least one of the harmonic frequency components of the electrical power signal being obtained.

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98. A method of measuring the value of an electrical power parameter, such as Apparent Power or Power Factor, of an electrical power signal, the method comprising:

converting an instantaneous voltage signal of the electrical power signal and an instantaneous current signal of the electrical power signal from the time domain into the frequency domain as frequency spectra;

calculating a first instantaneous power spectrum as the convolution of the frequency spectra of the instantaneous voltage signal and the instantaneous current signal;

carrying out a relative phase shift between the instantaneous voltage signal and the instantaneous current signal in the time domain;

calculating a second instantaneous power spectrum as the convolution of the

frequency spectra of the relatively phase-shifted instantaneous voltage and current signals;

combining each of the first and second power spectra to determine the value of the electrical power parameter.

99. A method of Claim 98, wherein the electrical power parameter comprises Apparent Power and the combining step comprises determining the square root of the sum of the squares of the frequency components of the first and second power spectra.

100. A method of Claim 98, wherein the step of carrying out a relative phase shift comprises carrying out a relative phase shift of 90 degrees.

101. A method according to Claim 98, further comprising filtering at least one of the instantaneous voltage or instantaneous current signals of the electrical power signal, in the frequency domain or prior to the conversion of the at least one signal into the frequency domain.

102. A method according to Claim 101, wherein the filtering step results in the fundamental frequency component of the electrical power signal being obtained.

103. A method according to Claim 101, wherein the filtering step results in at least one of the harmonic frequency components of the electrical power signal being obtained.

104. A method of measuring an electrical power parameter such as Apparent Power or Power Factor, of an electrical power signal, the method comprising:

filtering at least one of an instantaneous voltage signal or an instantaneous current signal of the electrical power signal;

using the filtered instantaneous voltage or current signal in:

calculating first and second instantaneous power components as the respective products of non phase-shifted/phase-shifted, instantaneous voltage and instantaneous current signals;

RMS averaging each of the first and second instantaneous power components to determine their respective magnitudes; and

using the calculated magnitudes to determine the value of the electrical power parameter.

105.A method according to Claim 104, wherein the filtering step results in the fundamental frequency component of at least one of the instantaneous voltage or instantaneous current signals being obtained.

106.A method according to Claim 104, wherein the filtering step results in at least one of the harmonic frequency components of at least one of the instantaneous voltage or instantaneous current signals being obtained.

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107.A method according to Claim 104, wherein the filtering step comprises:

filtering the instantaneous voltage signal to obtain its fundamental frequency components; and

using the filtered instantaneous voltage signal and the unfiltered instantaneous current signal to measure a Delivered Power Parameter frequency spectrum.

108.A method according to Claim 104, wherein the filtering step comprises:

filtering the instantaneous voltage signal to obtain its fundamental frequency components;

filtering the instantaneous current signal to obtain at least one of its harmonic frequency components; and

using the filtered signals to determine a Current Distortion Power Parameter.

109.A method according to Claim 104, wherein the filtering step comprises:

filtering the instantaneous voltage signal to obtain at least one of its harmonic frequency components;

filtering the instantaneous current signal to obtain its fundamental frequency components; and

using the filtered signals to determine a Voltage Distortion Power Parameter.

110.A method according to Claim 104, wherein the filtering step comprises:

filtering the instantaneous voltage signal to obtain at least one of its harmonic frequency components;

filtering the instantaneous current signal to obtain at least one of its harmonic frequency components; and

using the filtered signals to determine a Harmonic Apparent Power Parameter.

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111.A method according to Claim 107, further comprising comparing the Delivered Power Parameter, the Harmonic Apparent Power Parameter, the Voltage Distortion Power Parameter, or the Current Distortion Power Parameter with another power parameter determined by the method to produce a dimensionless figure of merit representative of the waveform distortion produced, in the electrical power signal, by a load to which the electrical power signal is supplied.

112.A method according to Claim 104, further comprising: providing two or more different types of filtering; and selecting between these different types of filtering to

obtain two or more different electrical power parameters.

113. A method of measuring a power quantity such as Apparent Power or Power Factor, of a multiple-phase electrical power signal, the method comprising:

resolving the multiple-phase signal into a phase sequence for use in establishing the effect on the electrical power signal of a load to which the electrical power signal is supplied;

using the phase sequence in:

calculating first and second instantaneous power components as the respective products of non phase-shifted/phase-shifted, instantaneous voltage and instantaneous current signals; and

RMS averaging each of the first and second power components to determine their respective magnitudes; and

using the calculated magnitudes to determine the value of the electrical power parameter.

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114. A method according to Claim 113, wherein the phase sequence comprises a positive phase sequence in order to obtain a measure representative of the power generated at a source of the electrical power signal.

115. A method according to Claim 113, wherein the phase sequence comprises negative and zero phase sequences in order to obtain a measure representative of the power generated in the load.

116. A method according to Claim 114, wherein the phase sequence comprises negative and zero phase sequences in order to obtain a measure representative of the power generated in the load and the positive, the negative and the zero-phase sequences are

used to obtain a measure representative of the power used by the load.

117.A method according to Claim 113, wherein the resolving step is operatively selectable by a user.

118.A method according to Claim 113, wherein the electrical power signal comprises an unbalanced multiple-phase power signal.

119.A method according to Claim 62, further comprising sampling the instantaneous voltage and instantaneous current signals to obtain a digital representation thereof and using the digital representations in the subsequent processing steps.

120.A method according to Claim 62, wherein the electrical power signal comprises a non-sinusoidal waveform signal.

121.A power meter for measuring the value of an electrical power parameter such as Apparent Power or Power Factor, of an electrical power signal, the meter being arranged to implement a method according to Claim 62.

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122.A power meter for measuring the value of an electrical power parameter such as Apparent Power or Power Factor, of an electrical power signal, the meter being arranged to implement a method according to Claim 89.

123. An electrical power meter for measuring the value of an electrical power parameter, such as Apparent Power or Power Factor, of an electrical power signal, the meter comprising:

means for calculating a first instantaneous power component as the product of an instantaneous voltage signal of the electrical power signal and an instantaneous current signal of the electrical power signal;

means for implementing a relative phase shift between the instantaneous voltage signal and the instantaneous current signal;

means for calculating a second instantaneous power component as the product of the relatively phase-shifted instantaneous voltage and instantaneous current signals;

mean for RMS averaging each of the first and second power components to determine their respective magnitudes; and

means for using the calculated magnitudes to determine the value of the electrical power parameter.

124. A power meter according to Claim 123, wherein the phase shifting means shifts the instantaneous voltage signal of the electrical power signal by 90 degrees prior to the calculating means calculating the second instantaneous power component.

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125. A power meter according to Claim 123, further comprising a step-down voltage means for stepping down the instantaneous voltage signal of the electrical power signal to a level suitable for measurement by the meter.

126. A power meter according to Claim 123, further comprising a conversion means for converting the instantaneous current signal of the electrical power signal to a representative voltage.

127. A power meter according to Claim 123, the meter being arranged to calculate several different power parameters and further comprising means for selectively displaying information regarding the values of the calculated power parameters.

128.A power meter according to Claim 123, further comprising means for sampling the instantaneous voltage and instantaneous current signals to obtain a digital representation thereof and means for using the digital representations in the subsequent processing steps.

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Respectfully submitted,

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